

# LONDON- WEST MIDLANDS ENVIRONMENTAL STATEMENT

## Volume 5 | Technical Appendices

CFA11 | Stoke Mandeville and Aylesbury  
**Data appendix (AG-001-011)**  
Agriculture, forestry and soils

November 2013

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Department  
for Transport

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# 1 Introduction

1.1.1 The agriculture, forestry and soils appendix for the Stoke Mandeville and Aylesbury community forum area (CFA 11) comprises:

- soils and agricultural land classification (ALC) surveys (Section 2);
- forestry (Section 3); and
- farm impact assessment summaries (Section 4).

1.1.2 Maps referred to throughout the agriculture, forestry and soils appendix are contained in the Volume 5, Agriculture, Forestry and Soils Map Book.

## 2 Soils and Agricultural Land Classification surveys

### 2.1 Background

- 2.1.1 The soils and agricultural baseline conditions reported have been established from desktop studies and site surveys.
- 2.1.2 Information gathered by desktop studies has related primarily to the identification of soil resources in the study area, the associated physical characteristics of geology, topography and climate which underpin the assessment of agricultural land quality, and the disposition of land uses. The main sources of information have included:
- National Soil Map<sup>1</sup>;
  - Soils and Their Use in South East England<sup>2</sup>;
  - solid and superficial deposits from the Geology of Britain viewer<sup>3</sup>;
  - gridpoint meteorological data for Agricultural Land Classification of England and Wales<sup>4</sup>;
  - Provisional Agricultural Land Classification of England and Wales (1:250,000)<sup>5</sup>;
  - Likelihood of Best and Most Versatile Agricultural Land (1:250,000)<sup>6</sup>;
  - agri-environment schemes<sup>7</sup>;
  - computer-aided light detection and ranging (LiDAR) elevation data for determination of gradient;
  - aerial photography; and
  - on-site soil and ALC surveys.
- 2.1.3 Information gathered by field survey has related to the enhancement of desk-based information on soils and agricultural land quality, and the engagement with landowners and tenants to establish the nature and extent of agricultural, forestry and related rural enterprises.
- 2.1.4 Where the collection of agricultural site information has enabled a review/refinement of published information this was undertaken in accordance with the methodology prescribed by the Ministry of Agriculture, Fisheries and Food (MAFF)<sup>8</sup>.

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<sup>1</sup> Cranfield University (2001), *The National Soil Map of England and Wales*

<sup>2</sup> Soil Survey of England and Wales (1984), *Soils and Their Use in South East England*.

<sup>3</sup> British Geological Survey. <http://bgs.ac.uk/geologyofbritain/home/html>; Accessed: 18 March 2013

<sup>4</sup> Meteorological Office (1989), *Gridpoint Meteorological data for Agricultural Land Classification of England and Wales and other Climatological Investigations*.

<sup>5</sup> Ministry of Agriculture, Fisheries and Food (MAFF) (1983), *Agricultural Land Classification of England and Wales* (1:250,000).

<sup>6</sup> Department for Environment, Food and Rural Affairs (Defra) (2005), *Likelihood of Best and Most Versatile Agricultural Land* (1:250,000).

<sup>7</sup> Multi-Agency Geographical Information for the Countryside (MAGIC) available on line @ <http://www.magic.gov.uk/>; Accessed: August 2013.

<sup>8</sup> MAFF (1988), *Agricultural Land Classification of England and Wales – Revised guidelines and criteria for grading the quality of agricultural land*.

- 2.1.5 Engagement with landowners and tenants between May 2012 and June 2013 has established the nature and extent of agricultural, forestry and related rural enterprises. Information obtained from farm impact assessment interview surveys has been taken as a factual representation of local agricultural and forestry interests and has not been subject to further evaluation.

## 2.2 Soils and land resources

- 2.2.1 This part of the appendix describes the findings of a desktop survey and targeted soil and ALC surveys that identify existing soil and agricultural land resources in the study area. Detailed ALC surveys were carried out at Moat Farm (Holding CFA11/6) and Putlowes Farm (CFA11/10).
- 2.2.2 The location and extent of soil types displaying different characteristics and of agricultural land in the different ALC grades are influenced by topography, drainage, geology and soil parent material which are described below. This section also provides a description and distribution of the main soil types encountered along the study corridor.

### Topography and drainage

- 2.2.3 The predominant topographical features in the Stoke Mandeville and Aylesbury section are the River Thames and its valley which lies at around 80m above Ordnance Datum (AOD). The valley sides rise up into a series of typically gently undulating hills to around 140m AOD.

### Geology and soil parent materials

- 2.2.4 The principal underlying geology mapped by the British Geological Survey is the Gault Clay Formation. This bedrock comprises clay or mudstone with a sandy base. A band of variable limestone and sandstone units marks the mid-section boundary between the Gault Formation and Kimmeridge Clay which is prominent in the northern half of the section. The Kimmeridge Clay is composed of mudstones, thin siltstone and cementstone beds, with localised sands and silts.
- 2.2.5 Superficial Head deposits of clay, silt, sand and gravel are mapped in the valleys containing the River Thames and its tributaries. A list of geological strata occurring within the study area is provided in age order in Table 1 and shown on Map WR-02-011 (Volume 5, Water Resources Map Book).

Table 1: Bedrock and soil forming materials

Formation	Composition/soil parent material
Kimmeridge Clay	Calcareous or kerogen-rich silty or sandy mudstones with thin siltstone and cementstone beds.
Gault	Clay or mudstone, with a sandy base.
Superficial deposits	
Head	Poorly sorted and poorly stratified gravel, sand and clay depending on upslope source.

## Description and distribution of soil types

- 2.2.6 The characteristics of the soils are described by the Soil Survey of England and Wales<sup>2</sup> and shown on the National Soil Map<sup>1</sup>. The soils are grouped into associations of a range of soil series showing similar characteristics.
- 2.2.7 The soils throughout this area are variable according to the topography and geology. To the east and south the underlying Gault Clay around Stoke Mandeville gives rise to the fine loamy and clay soils of the Grove association, which are calcareous and typically seasonally waterlogged, of Wetness Class<sup>9</sup> (WC) III, but easily improved to WC II with underdrainage.
- 2.2.8 In the middle section, on the hills and highest lying ground are Evesham 2 and Aberford association soils. Evesham 2 soils are generally calcareous clays but have local variations in depth and drainage depending upon the parent material, which consists of Jurassic clay and limestone bands. With underdrainage, Evesham 2 soils are typically of WC II or III. Aberford soils are well drained (WC I), fine loamy and calcareous soils over limestone but with variable stone content. Aberford soils are dominant on the hill tops.
- 2.2.9 The floodplain of the River Thame is associated with intrusions of Fladbury 1 soils to the west of Aylesbury, which are deep, clayey and poorly drained and most commonly of WC IV.
- 2.2.10 In the central and northern section extensive areas of the Denchworth association are mapped. These soils are developed over the heavy Kimmeridge and Gault clays and are characteristically clayey, of WC IV and thus remain waterlogged for prolonged periods throughout the year.
- 2.2.11 Figure 1 shows how topography, geology and many of the soil types in the area relate in a landscape context. A detailed profile description for the Fladbury 1 association present within the Stoke Mandeville and Aylesbury section is included in Table 2. References made to soil colours have been derived from a standard Munsell Soil Colour Chart<sup>10</sup>.
- 2.2.12 Where detailed profile descriptions are not available for the remaining soil series, standard profiles are depicted in Figure 2.

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<sup>9</sup> The Wetness Class (WC) of a soil is classified according to the depth and duration of waterlogging in the soil profile and has six bands.

<sup>10</sup> Munsell Color Charts (2000), *Munsell Color Charts*, Grand Rapids, MI, USA.



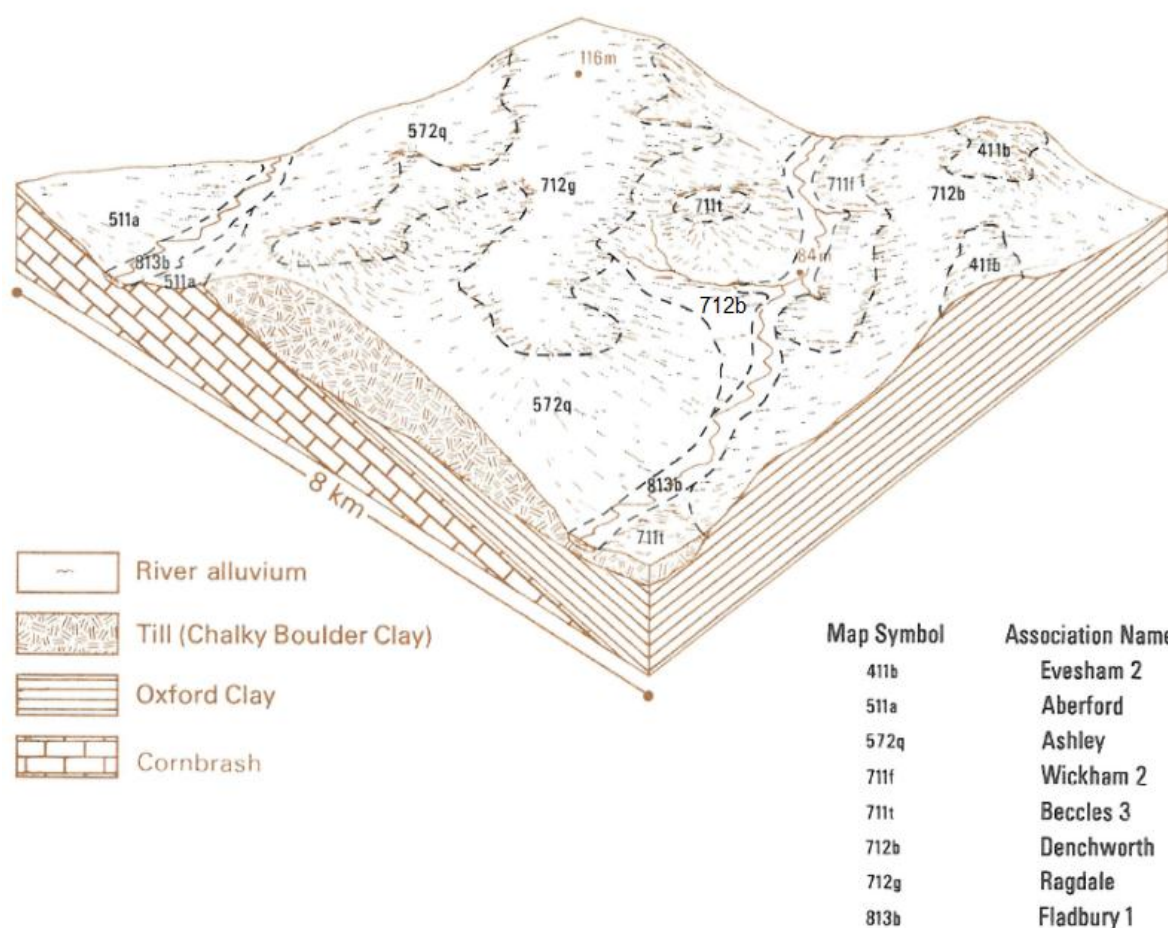
Figure 1: Soil associations found around Stoke Mandeville and Aylesbury in a landscape context <sup>11</sup>

Table 2: Profile description of dominant soil series

Fladbury series
0cm - 24cm, dark brown (10YR3/3) <sup>12</sup> stoneless clay; moist; moderately developed medium angular blocky; low packing density; moderately weak soil strength; few very fine fibrous roots; non-calcareous; sharp smooth boundary.
24cm – 53cm, greyish brown (2.5Y5/2) stoneless clay with very many fine strong brown (7.5YR5/8) mottles; moderately developed coarse prismatic with greyish brown (10YR5/2) faces; medium packing density; moderately firm ped strength; few very fine fibrous roots; non-calcareous; few irregular soft ferri-manganiferous concentrations; abrupt smooth boundary.
53cm – 78cm, dark grey (10YR4/1) slightly stony clay with many medium yellowish brown (10YR5/6) mottles; very small subangular sandstone; very moist; moderately developed coarse prismatic with dark greyish brown (10YR4/2) faces; medium packing density; moderately firm soil strength; very few fine fibrous roots; non-calcareous; few rounded ferri-manganiferous nodules; clear smooth boundary.
78cm – 94cm, dark greyish brown (10YR4/2), stoneless clay loam with many medium reddish brown (5YR4/4) mottles; very moist; moderately developed medium prismatic with dark grey (10YR4/1) faces; medium packing density; moderately weak soil strength; common very fine

<sup>11</sup> National Soil Resources Institute (NSRI) 2013. *The Soils Guide*. Cranfield University, UK. Available: [www.landis.org.uk](http://www.landis.org.uk); Accessed: August 2013

<sup>12</sup> Munsell colour notation describes colour by three attributes: hue (with five principle colours - red (R), yellow (Y), green (G), blue (B), and purple (P) with a preceding intermediate value 2.5-10; value or brightness where zero is black (most dark) and ten is white (most light); and chroma that distinguishes the difference from a pure hue to a grey shade.

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**Fladbury series**

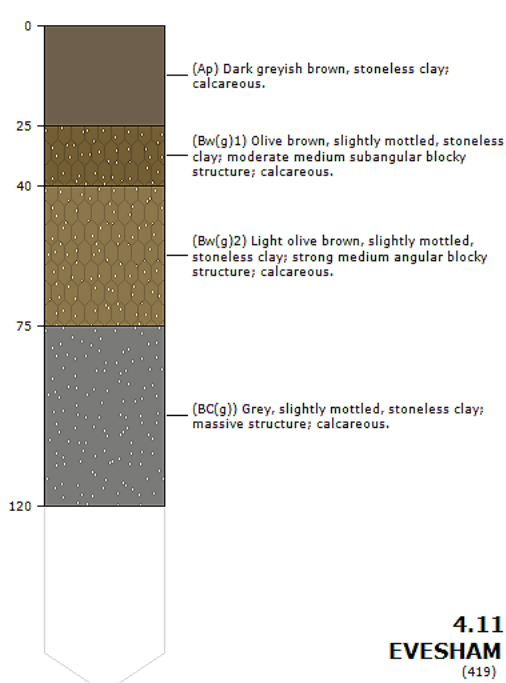
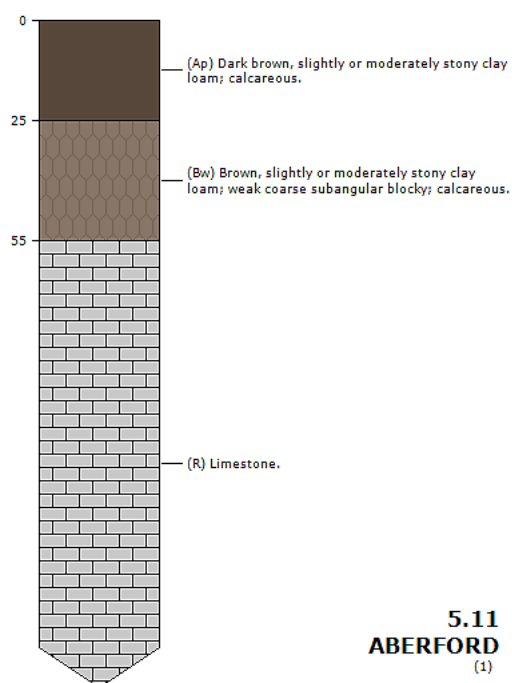
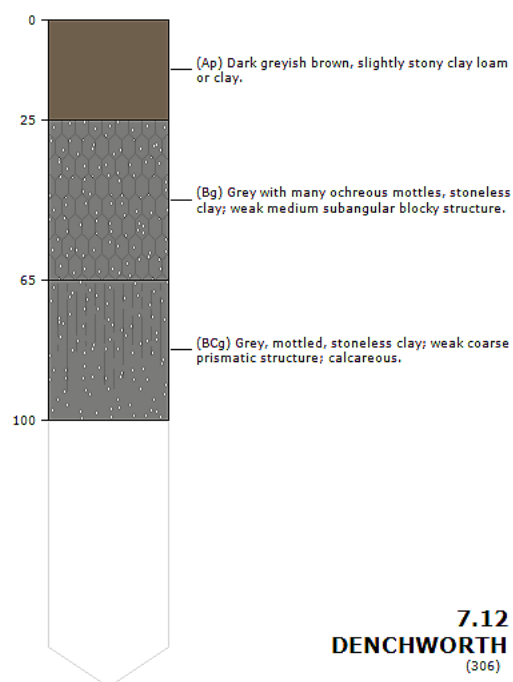
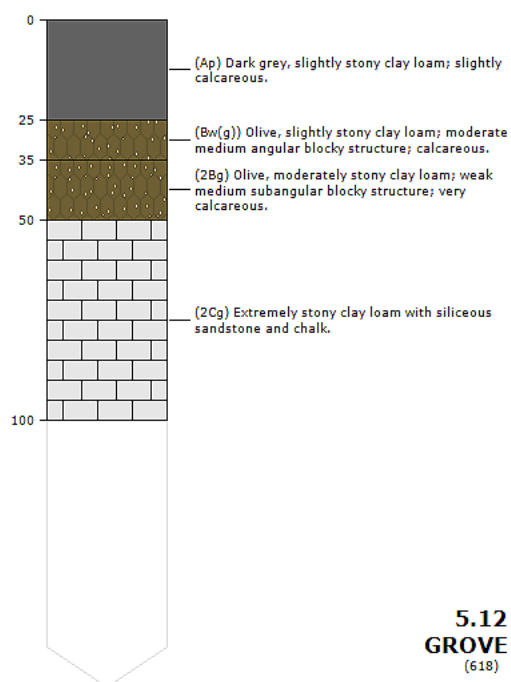
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fibrous roots; non-calcareous; common rounded soft ferruginous concentrations; abrupt wavy boundary.

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94cm – 120cm, light grey to grey (10YR6/1) stoneless clay with many fine strong brown (7.5YR5/6) mottles; wet; weakly developed; adherent medium angular blocky with greyish brown (10YR5/2) faces; medium packing density; moderately firm soil strength; few very fine fibrous roots; non-calcareous.

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Figure 2: Typical profiles of soil series present in the Stoke Mandeville and Aylesbury study area<sup>13</sup><sup>13</sup> National Soil Resources Institute (NSRI) 2013. *The Soils Guide*. Cranfield University, U; Available: [www.landis.org.uk](http://www.landis.org.uk); Accessed August 2013.

## 2.3 Soil and land use interactions

### *Agricultural land quality*

- 2.3.1 A review of background ALC information has been undertaken to ascertain the land quality context within the study area. A number of detailed post-1988 ALC surveys have been undertaken in the area that show the land to be borderline Subgrade 3a and Subgrade 3b quality.
- 2.3.2 Two additional surveys have been undertaken in this section for the purpose of this assessment at Moat Farm (CFA11/6) between Aylesbury and Stoke Mandeville and Putlowes Farm (CFA11/10) to the north-west of Aylesbury.

### *Detailed Agricultural Land Classification survey*

- 2.3.3 At the time of the survey the land at both sites was in pasture.
- 2.3.4 Soil profiles were examined using an Edelman (Dutch) auger and spade. Approximately one observation was made for each 100m linear run of the Proposed Scheme within each holding. At each observation point the following characteristics were assessed for each soil horizon up to a maximum of 120cm or any impenetrable layer:
- soil texture;
  - significant stoniness;
  - colour (including local gley and mottle colours);
  - consistency;
  - structural condition;
  - free carbonate; and
  - depth.
- 2.3.5 Soil wetness was inferred from the matrix colour, presence or absence of, and depth to, greyish and ochreous gley mottling and/or poorly permeable subsoil layers at least 15cm thick.
- 2.3.6 Soil droughtiness was investigated by the calculation of moisture balance equations. Crop-adjusted available water is estimated from texture, stoniness and depth, and then compared to a calculated moisture deficit for the standard crops of wheat and potatoes. The moisture deficit is a function of potential evapotranspiration and rainfall. Grading of the land can be affected if the crop-adjusted available water is insufficient to balance the moisture deficit and droughtiness occurs. When a profile is found with significant stoniness, sufficient to prevent penetration of a hand auger, then it is assumed, for the purposes of calculating droughtiness, that similar levels of stoniness continue to the full 1.2m depth considered. The methodology and calculation used to determine the severity of a droughtiness limitation is given in Figure 3.

Figure 3: Methodology for calculating the severity of a droughtiness limitation to Agricultural Land Classification grading<sup>14</sup>

$$AP \text{ wheat (mm)} = \frac{TA_{vt} \times LT_t + \sum (TA_{vs} \times LT_{50}) + \sum (EA_{vs} \times LT_{50-120})}{10}$$

where

$TA_{vt}$  is Total available water ( $TA_v$ ) for the topsoil texture

$TA_{vs}$  is Total available water ( $TA_v$ ) for each subsoil layer

$EA_{vs}$  is Easily available water ( $EA_v$ ) for each subsoil layer

$LT_t$  is thickness (cm) of topsoil layer

$LT_{50}$  is thickness (cm) of each subsoil layer to 50 cm depth

$LT_{50-120}$  is thickness (cm) of each subsoil layer between 50 and 120 cm depth

$\Sigma$  means 'sum of'.

$$AP \text{ potatoes (mm)} = \frac{TA_{vt} \times LT_t + \sum (TA_{vs} \times LT_{70})}{10}$$

where

$LT_{70}$  is thickness (cm) of each subsoil layer to 70 cm depth

**MB (Wheat) = AP (Wheat) - MD (Wheat)**

**MB (Potatoes) = AP (Potatoes) - MD (Potatoes)**

Where

MB is the Moisture Balance

AP is the Crop-adjusted available water capacity

MD is the moisture deficit, as determined by the agro-climatic assessment.

**Table 8      Grade according to droughtiness**

Grade/ Subgrade	Moisture Balance limits (mm)		
	<i>wheat</i>		<i>potatoes</i>
1	+30	and	+10
2	+5	and	-10
3a	-20	and	-30
3b	-50	and	-55
4	<-50	or	<-55

<sup>14</sup> Derived from: MAFF (1988), *Agricultural Land Classification of England and Wales – Revised guidelines and criteria for grading the quality of agricultural land*.

- 2.3.7 Approximately 152ha of agricultural land around Aylesbury was surveyed by MAFF in May 1996 and validated by Reading Agricultural Consultants in October 1996. This survey showed topsoil to be non-calcareous and clayey overlying clayey and loamy subsoil. Subsoils became gleyed and mottled at various depths. On the highest and lowest ground surveyed, soils became slowly permeable at depth such that the profiles were assessed as WC II to IV. In combination with clayey topsoil textures, this led to 54% being assessed as Subgrade 3b. On the lower ground the soils were better drained (WC I) with a wetness and workability limitation to Subgrade 3a.
- 2.3.8 The surveys at Moat Farm and Putlowes Farm typically found around 25cm topsoil of clayey and loamy texture, overlying clay subsoils. Although the soils found conform well to those described in the area, topsoils were not found to be calcareous. A typical profile from each site is described below in Table 3.
- 2.3.9 The surveys found land to comprise mostly Subgrade 3b quality limited by droughtiness. Occasional, deeper profiles were restricted to the same subgrade by soil wetness due to mottling and slow permeability in the subsoils, combined with clayey topsoil textures.
- 2.3.10 Approximately 17% of the area surveyed at Putlowes Farm and around 10% of land surveyed at Moat Farm was of higher Subgrade 3a quality.

Table 3: Typical soil profiles at Moat Farm and Putlowes Farm

Moat Farm	Putlowes Farm
0cm – 25cm, heavy clay loam; very dark grey (10YR3/1); slightly stony (flint); non-calcareous.	0cm – 25cm, clay or silty clay; brown (10YR3/2); non-calcareous.
25cm – 40cm, clay; light yellowish brown (2.5Y6/3) with many, medium, distinct ochreous mottles and ferri-manganiferous concentrations; non-calcareous; occasionally slowly permeable.	25cm – 40cm, clay; dark greyish brown (10YR4/2 or 2.5Y4/2); gleyed; many distinct or prominent ochreous mottles; non-calcareous.
Variable below 40cm – clay or chalk.	40+ cm, heavy clay; greyish brown (2.5Y5/2) or grey (N5); many medium distinct ochreous mottles; slowly permeable.

### *Desk assessment of agricultural land quality*

- 2.3.11 The study area has been subject to an intensive desk based assessment which has relied on the interpretation of soil mapping, topography and agro-climatic data, and the interactions between each factor. This resulted in an assessment of the likely soil textures, soil drainage status, landform, gradient, presence of or depth to poorly permeable soil layers and the extent to which crop growth may be limited by soil droughtiness.
- 2.3.12 A professional judgement was then made as to the predominant ALC grade which was likely for a soil with the given characteristics found in the climatic zone of the location within the study area. The judgement was influenced by the surveyor's experience of previous surveys in the locality and on similar soil types. The resulting grade is that which is considered to be the most likely grade that would be found should a detailed

site investigation be conducted although this does not mean in all cases that that grade will be found in practice.

- 2.3.13 Context land quality was ascertained using information derived from the provisional ALC maps of England and Wales produced by the former MAFF in the 1960s and 1970s. These maps show the section to be provisionally mapped as approximately equal proportions of Grade 3, good to moderate quality land and Grade 4, poor quality land. These maps were originally published at a scale of 1:63,360 and are available at a scale of 1:250,000 in paper and digital formats. The main limitations of these provisional maps are that they are published on strategic scales only and according to a methodology which has since been revised twice. Therefore they cannot be used to definitively classify individual sites and hence further data analysis was conducted.

### *Agro-climatic data*

- 2.3.14 Climate in CFA11 does not in itself place any limitation upon land quality but the interactions of climate with soil characteristics are important in determining the wetness and droughtiness limitations of the land. The influence of climate on soil wetness is assessed by reference to median field capacity days (FCD), when the soil moisture deficit is zero, and topsoil texture.
- 2.3.15 The local agro-climatic data have been interpolated from the Meteorological Office's standard 5km grid point data set for three locations within the area set out in Table 4. The data show the area to be moderately warm and dry, with an accumulated temperature range of 1,401 - 1,418 day°C and average annual rainfall of 639mm. The average number of FCD is approximately 137 which is lower than the average for lowland England and is favourable for providing opportunities for agricultural land working.

Table 4: Local agro-climatic conditions

	Aylesbury	Putlowes Farm	Moat Farm
Altitude (AOD)	90m	75m	90m
Average annual rainfall	639mm	628mm	651mm
Accumulated temperature above 0°C	1,413 day°	1,418 day°	1,401 day°
Field capacity days	138 days	132 days	141 days
Average moisture deficit, wheat	110mm	111mm	109mm
Average moisture deficit, potatoes	103mm	104mm	101mm

### *Site limitations*

- 2.3.16 The assessment of site factors is primarily concerned with the way in which topography influences the use of agricultural machinery and hence the cropping potential of land. Gradient and microrelief are not considered likely to have a limiting effect on the land grading across the Stoke Mandeville and Aylesbury section of the Proposed Scheme.

- 2.3.17 Flooding is limited to the floodplains of the River Thame and its tributaries through the north west of CFA11; it is a potential limitation to agricultural land quality and could downgrade agricultural land to Subgrade 3b or Grade 4 depending on the frequency and severity of flooding.

### *Soil limitations*

- 2.3.18 The main soil properties which affect the cropping potential and management requirements of land are texture, structure, depth, stoniness and chemical fertility. Together they influence the functions of soil and affect the water availability for crops, drainage, workability and trafficability.

- 2.3.19 There are three distinct soil characteristics within the study area:

- the fine loamy and clayey soils overlying mixed geology and which display variable depths and stoniness;
- the clayey and loamy soils occupying undulating land; and
- the slowly permeable wet alluvial soils surrounding the river channels.

### *Interactive limitations*

- 2.3.20 The physical limitations which result from interactions between climate, site and soil are soil wetness, droughtiness and susceptibility to erosion. Each soil can be allocated a WC based on soil structure, evidence of waterlogging and the number of FCD; the topsoil texture then determines its ALC grade, set out in Figure 4.
- 2.3.21 Soils of the Grove association which are present around Stoke Mandeville are typically of WC III or, if improved with artificial drainage, WC II. Given that there are around 137 FCD in this section, and that the calcareous Grove soils typically display fine loamy topsoil textures, the resultant limitation to the land grading according to soil wetness will be to Grade 2 or 3a, depending upon the specific clay content of the topsoils in the locality. In fact, the detailed field surveys have identified soils that are non-calcareous and limited to Subgrade 3a due to texture.
- 2.3.22 Calcareous Evesham 2 soils of WC II or III with heavy clay loam topsoils are limited to Subgrade 3a in this area.
- 2.3.23 The well drained, fine loamy Aberford soils are likely to be most severely limited by droughtiness, particularly in areas where stoniness might locally increase with depth, which itself may be limited by the underlying limestone. In this area Aberford soils are limited to Subgrade 3a on droughtiness.
- 2.3.24 Soils of the Fladbury 1 association are clayey and slowly permeable. Using the profile description given in Table 2, the Fladbury soils are of WC IV which, in combination with the agro-climatic conditions in this area, are limited to no better than Subgrade 3b. The same applies to the soils of the Denchworth association, which are similarly clayey and slowly permeable, and overlie heavy Kimmeridge and Gault clay geology.



Figure 4: ALC grade according to soil wetness<sup>15</sup>

Wetness Class	Texture <sup>1</sup> of the top 25 cm	Field Capacity Days				
		<126	126-150	151-175	176-225	>225
I	S <sup>2</sup> LS <sup>3</sup> SL SZL	1	1	1	1	2
	ZL MZCL MCL SCL	1	1	1	2	3a
	HZCL HCL	2	2	2	3a	3b
	SC ZC C	3a(2)	3a(2)	3a	3b	3b
II	S <sup>2</sup> LS <sup>3</sup> SL SZL	1	1	1	2	3a
	ZL MZCL MCL SCL	2	2	2	3a	3b
	HZCL HCL	3a(2)	3a(2)	3a	3a	3b
	SC ZC C	3a(2)	3b(3a)	3b	3b	3b
III	S <sup>2</sup> LS SL SZL	2	2	2	3a	3b
	ZL MZCL MCL SCL	3a(2)	3a(2)	3a	3a	3b
	HZCL HCL	3b(3a)	3b(3a)	3b	3b	4
	SC ZC C	3b(3a)	3b(3a)	3b	4	4
IV	S <sup>2</sup> LS SL SZL	3a	3a	3a	3b	3b
	ZL MZCL MCL SCL	3b	3b	3b	3b	3b
	HZCL HCL	3b	3b	3b	4	4
	SC ZC C	3b	3b	3b	4	5
V	S LS SL SZL	4	4	4	4	4
	ZL MZCL MCL SCL	4	4	4	4	4
	HZCL HCL	4	4	4	4	4
	SC ZC C	4	4	4	5	5
Soils in Wetness Class VI - Grade 5						

<sup>1</sup>For naturally calcareous soils with more than 1% CaCO<sub>3</sub> and between 18% and 50% clay in the top 25 cm, the grade, where different from that of other soils, is shown *in brackets*

<sup>2</sup> Sand is not eligible for Grades 1, 2 or 3a

<sup>3</sup> Loamy sand is not eligible for Grade 1

Where S = sand, Z = silt, C = clay, L = loamy and P = peat.

For sand the coarseness of the grain is sub-divided into coarse (c), medium (m) and fine (f). The subdivisions of clay loam and silty clay loam classes are indicated as medium (M) (less than 27% clay); heavy (H) (27-35% clay).

The average number of FCD in the Stoke Mandeville & Aylesbury area is 137, and shown in the highlighted column.

<sup>15</sup> Derived from: MAFF, (1988), *Agricultural Land Classification of England and Wales – Revised guidelines and criteria for grading the quality of agricultural land*.

### 3 Forestry

- 3.1.1 Assessment of forestry resources has primarily had regard to the National Forest Inventory<sup>16</sup>. The area of land under forestry (i.e. trees and woodland) within 2km either side of the route centre line has been derived using Geographic Information System (GIS), and is shown in Table 5.
- 3.1.2 Almost all of the woodland within CFA11 is within the grounds of Hartwell House, with other smaller woodland consisting of field shelter belts and the small copse at the former site of St Mary's Church.

Table 5: Area of woodland within the study area and construction boundary

	Area of forestry land (ha)	Percentage of forestry land (%)
Forestry land in 4km-wide study area	134.4	3% (forestry land use within 4km-wide study area)
Forestry land within construction boundary	4.5	Approximately 1% of the land required for the construction of the Proposed Scheme is presently wooded

<sup>16</sup> Forestry Commission (2001), *National Forest Inventory Woodland and Ancient Woodland* (as updated).

## 4 Assessment of effects on holdings

- 4.1.1 The effects on holdings have been assessed through a series of interviews with farmers along the proposed route carried out between May 2012 and June 2013, according to the methodology set out in Technical Note AG5 (within Volume 5: Appendix CT-001-000/2). Where interviews have not been possible the data has been estimated, as described in Scope and Methodology Addendum (Volume 5: Appendix CT-001-000/2).
- 4.1.2 The nature of impacts considered comprises the temporary and permanent land required from the holding, the temporary and permanent severance of land, the permanent loss of key farm infrastructure and the imposition of disruptive effects (particularly noise and dust) on land uses and the holding's operations. These impacts occur primarily during the construction phase of the Proposed Scheme and are set out in Table 6.

Table 6: Summary of assessment of effect on holdings

Holding reference, name and description	Construction effects	Residual effects post restoration of land required temporarily
CFA11/1  Stoke House  93ha arable and grassland for equestrian yard  Medium sensitivity to change	Land required: 22.2ha (24%). High impact.  Severance: farmland severed by A4010 Stoke Mandeville bypass but access maintained with accommodation structure. Low impact.  Disruptive effects: no impact on agricultural activity: construction dust and noise controlled via the mitigation measures set out within the draft Code of Construction Practice <sup>17</sup> (CoCP). Negligible impact.	Land required: 13.0ha (14%). Medium impact.  Severance: farmland severed by A4010 Stoke Mandeville bypass but access maintained with accommodation structure. Low impact.  Infrastructure: no buildings or other farm infrastructure affected. Negligible impact.
	Overall temporary assessment: major/moderate effect due to proportion of holding required and severance.	Overall permanent assessment: moderate effect due to proportion of holding permanently required and severance.
CFA11/2  Windrush House, Terrick  104ha all land let to others for arable and grazing  Low sensitivity to change	Land required: 11.8ha (11%). Medium impact  Severance: none. Negligible impact.  Disruptive effects: no impact on agricultural activity: construction dust and noise controlled via mitigation measures set out within the draft CoCP. Negligible impact.	Land required: 6.2ha (6%). Low impact.  Severance: none. Negligible impact.  Infrastructure: no buildings or other farm infrastructure affected. Negligible impact.

<sup>17</sup> (Volume 5: Appendix CT-003-000)

Holding reference, name and description	Construction effects	Residual effects post restoration of land required temporarily
	Overall temporary assessment: Minor effect	Overall permanent assessment: negligible effect
CFA11/3 *  Mill House Farm  3.2ha poultry rearing  Medium sensitivity to change	Land required: 0.9ha (29%). High impact.  Severance: none. Negligible impact.  Disruptive effects: no impact on agricultural activity: construction dust and noise controlled via mitigation measures set out within the draft CoCP. Negligible impact.	Land required: 0.6ha (18%). Medium impact.  Severance: none. Negligible impact.  Infrastructure: no buildings or other farm infrastructure affected. Negligible impact.
	Overall temporary assessment: major/moderate effect due to proportion of holding required.	Overall permanent assessment: moderate effect due to the proportion of the holding required.
CFA11/4  Marsh Mill Farm and Yew Tree Farm  194ha arable, cattle, sheep  Medium sensitivity to change	Land required: 6.2ha (3%). Negligible impact.  Severance: land permanently severed by Proposed Scheme and A4010 Stoke Mandeville bypass accessible from public highway. As land already severed from main holding impact downgraded. Low impact.  Disruptive effects: no impact on agricultural activity: construction dust and noise controlled via mitigation measures set out within the draft CoCP. Negligible impact.	Land required: 3.3ha (2%). Negligible impact.  Severance: land permanently severed by Proposed Scheme and A4010 Stoke Mandeville bypass accessible from public highway. As land already severed from main holding impact downgraded. Low impact.  Infrastructure: no buildings or other farm infrastructure affected. Negligible impact.
	Overall temporary assessment: minor effect.	Overall permanent assessment: minor effect
CFA11/5  Whitethorn Farm  8ha grassland for grazing, some let  Low sensitivity to change	Land required: 4.7ha (57%). High impact.  Severance: holding severed no access provided. High impact.  Disruptive effects: no impact on agricultural activity: construction dust and noise controlled via mitigation measures set out within the draft CoCP. Negligible impact.	Land required: 2.3ha (27%). High impact.  Severance: holding severed no access provided. High impact.  Infrastructure: agricultural buildings demolished (not residential). High impact.
	Overall permanent assessment: moderate effect due to proportion of the holding required and severance.	Overall permanent assessment: moderate effect due to building demolition and the proportion of the holding required but low sensitivity of holding.

Holding reference, name and description	Construction effects	Residual effects post restoration of land required temporarily
<p>CFA11/6</p> <p>Moat Farm</p> <p>360ha arable, cattle, sheep</p> <p>Medium sensitivity to change</p>	<p>Land required: 70.2ha (20%). High impact.</p> <p>Severance: holding considerably severed by permanent works, additional land severed to east of Proposed Scheme, limited access available. Medium impact.</p> <p>Disruptive effects: no impact on agricultural activity: construction dust and noise controlled via mitigation measures set out within the draft CoCP. Negligible impact.</p>	<p>Land required: 49.7ha (14%). Medium impact.</p> <p>Severance: holding severed by Proposed Scheme and A4010 Stoke Mandeville bypass. Partial remedy with accommodation structures but still reliant on public highway. Medium impact.</p> <p>Infrastructure: no buildings or other farm infrastructure affected. Negligible impact.</p>
	Overall temporary assessment: major/moderate effect due to proportion of the holding required and severance.	Overall permanent assessment: moderate effect due to proportion of the holding required and severance.
<p>CFA11/7</p> <p>Standall's Farm</p> <p>263ha arable and beef cattle</p> <p>Medium sensitivity to change</p>	<p>Land required: 17.9ha (7%). Low impact.</p> <p>Severance: small parcel of severed land required for landscape mitigation planting, therefore no severance. Partial severance during utility diversion works. Access likely to be available therefore impact downgraded. Low impact.</p> <p>Disruptive effects: no impact on agricultural activity: construction dust and noise controlled via mitigation measures set out within the draft CoCP. Negligible impact.</p>	<p>Land required: 8.8ha (3%). Negligible impact.</p> <p>Severance: small parcel of severed land required for landscape mitigation planting - no severance. Negligible impact.</p> <p>Infrastructure: no buildings or other farm infrastructure affected. Negligible impact.</p>
	Overall temporary assessment: minor effect.	Overall permanent assessment: negligible effect.
<p>CFA11/8</p> <p>Calley Farm</p> <p>283ha cattle and arable</p> <p>High sensitivity to change</p>	<p>Land required: 103.7ha (37%). High impact.</p> <p>Severance: land severed to the north of the Proposed Scheme all to be acquired for landscape mitigation. Partial additional severance during utility diversion works. Access likely to be available therefore impact downgraded. Low impact.</p> <p>Disruptive effects: no impact on agricultural activity: construction dust and noise controlled via mitigation measures set out within the draft CoCP. Negligible</p>	<p>Land required: 82.8ha (29%). High impact.</p> <p>Severance: land severed to the north of the Proposed Scheme all to be acquired for landscape mitigation. Negligible impact.</p> <p>Infrastructure: no buildings or other farm infrastructure affected. Negligible impact.</p>

Holding reference, name and description	Construction effects	Residual effects post restoration of land required temporarily
	impact.	
	Overall temporary assessment: major effect due to proportion of the holding required and severance and high sensitivity of the holding.	Overall permanent assessment: major effect due to proportion of the holding required and high sensitivity of the holding.
CFA11/9  Lower Hartwell Farm and Whaddon Hill Farm  283ha arable and beef cattle  Medium sensitivity to change	Land required: 25.4ha (9%) Low impact.  Severance: severance during construction of River Thames viaduct and access works - small size therefore downgraded. Low impact.  Disruptive effects: no impact on agricultural activity: construction dust and noise controlled via mitigation measures set out within the draft CoCP. Negligible impact.	Land required: 15.3ha (5%). Low impact.  Severance: land severed to the north of the Proposed Scheme accessible under viaduct. Negligible impact.  Infrastructure: no buildings or other farm infrastructure affected. Negligible impact.
	Overall temporary assessment: minor effect.	Overall permanent assessment: minor effect.
CFA11/10  Putlowes Farm  156ha arable and beef cattle  Medium sensitivity to change	Land required: 28.6ha (18%) Medium impact.  Severance: farm severed accommodation structure provided. Low impact.  Disruptive effects: no impact on agricultural activity: construction dust and noise controlled via mitigation measures set out within the draft CoCP. Negligible impact.	Land required: 17.9ha (11%). Medium impact.  Severance: farm severed accommodation structure provided. Low impact.  Infrastructure: no buildings or other farm infrastructure affected. Negligible impact.
	Overall temporary assessment: moderate effect due to proportion of holding required and severance.	Overall permanent assessment: moderate effect due to proportion of the holding required and severance.
CFA11/11  Fleet Marston Farm  185ha arable  Medium sensitivity to change	Land required: 15.9ha (9%). Low impact.  Severance: small area of land severed by the Proposed Scheme to be acquired for landscape mitigation. Negligible impact.  Disruptive effects: no impact on agricultural activity: construction dust and noise controlled via mitigation measures set out within the draft CoCP. Negligible impact.	Land required: 6.3ha (3%). Negligible impact.  Severance: small area of land severed by the Proposed Scheme to be acquired for landscape mitigation. Negligible impact.  Infrastructure: no buildings or other farm infrastructure affected. Negligible impact.

Holding reference, name and description	Construction effects	Residual effects post restoration of land required temporarily
	Overall temporary assessment: minor effect.	Overall permanent assessment: negligible effect.
CFA11/12 *  Bucks Goat Centre  1.4ha goat rescue and visitor centre  High sensitivity to change	Land required: < 0.1ha (3%). Negligible impact.  Severance: none. Negligible impact.  Disruptive effects: no impact on agricultural activity: construction dust and noise controlled via mitigation measures set out within the draft CoCP. Negligible impact.	Land required: < 0.1ha (1%) Negligible impact  Severance: none. Negligible impact.  Infrastructure: no buildings or other farm infrastructure affected. Negligible impact.
	Overall temporary assessment: minor effect.	Overall permanent assessment: minor effect.
CFA11/13 *  Red House Farm  42ha grazing  Medium sensitivity to change	Land required: 0.3ha (1%) Negligible impact.  Severance: none. Negligible impact.  Disruptive effects: no impact on agricultural activity: construction dust and noise controlled via draft CoCP. Negligible impact.	Land required: 0.3ha (1%) Negligible impact.  Severance: none. Negligible impact.  Infrastructure: no buildings or other farm infrastructure affected. Negligible impact.
	Overall temporary assessment: negligible effect.	Overall permanent assessment: negligible effect.

\* No Farm impact assessment interview conducted; data estimated

## 5 References

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